



## AI IS TRANSFORMING EDUCATION TECHNOLOGY AND EDUCATION SYSTEM IN INDIA

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### Abstract

*Scholars who apply artificial intelligence to political questions seek, most generally, to expand the scope and relevance of political model analysis. By incorporating the effects of variable human notions, traditions, and meanings, they seek to humanize political models. Most early applications of artificial intelligence in political science research address substantive issues pertaining to political decision making. Most of these works apply production-system technology to construct choice models in for eign-policy decision contexts. In recent years, political applications have begun to diver sify. Today, lively research efforts flourish in widely varied application areas, such as computational text analysis, logic programming, computer learning, and conflict sim ulation. The works reviewed here constitute the early steps of a nascent program of study. Much remains to be accomplished. Nevertheless, the efforts conducted thus far suggest many potentially fruitful research avenues. Youth are the most essential and promising segment of every country's population. India has a larger advantage over other countries in terms of becoming a global leader because we effectively tap into the youth's potential. Quality education is the only way to achieve this. With artificial intelligence's potential growth in India, now is the ideal time to incorporate AI in education to reap its benefits and prepare India's young for the future. Artificial intelligence has great potential in India. India's AI technology has the potential to make it a world leader in artificial intelligence. In India, AI technology is used effectively in nearly every area, including agriculture, healthcare, education, infrastructure, transportation, retail, manufacturing, and so on. By 2035, artificial intelligence has the potential to add US\$1 trillion to the Indian economy. According to the study, AI technology in India has the potential to overcome physical capital and labor constraints, therefore creating new sources of value and growth. In India, AI technology can automate both difficult and*

*routine processes, which may lead to better use of human resources by allowing them to focus their efforts where they contribute the most value, boosting overall efficiency. There are a few industries where the influence of artificial intelligence in India is believed to provide substantial advantages, including education, health, agriculture, infrastructure, and transportation. The most crucial segment of every country's population is its youth. And good education is essential for it to be capable of leading the country toward a brighter future. With the influence of AI in education in India growing by the day, the education sector must adapt its plans to account for the impact of AI in education in India and how it can assist today's young minds to become tomorrow's capable leaders and innovators. AI in education in India will also play a key part in attaining the country's 2030 objectives, which are aligned with the UN Sustainable Development Goals. One of these goals is to expand the number of competent instructors significantly.*

**Key words:** Artificial Intelligence; Promising Applications, Potential Effectiveness.

### *Introduction*

While the idea of Artificial Intelligence (AI) is not new, its emerging avatar, based on the three underlying phenomena of big data, machine learning and exponential increase in computing power has enabled AI to become a reality. Algorithms created through machine learning are being able to meet the Turing tests, of exhibiting intelligent behavior indistinguishable from that of a human, covering high-level cognitive processes like thinking, perceiving, learning, problem solving / decision-making etc. The history of Artificial Intelligence (AI) can be traced from 1950 when Allen Turing, recognised as the father of AI, developed a 'Turing Machine' which was enabled with like a computer programme that shows human like intelligence. But, the term AI coined by John McCarthy in 1956 who has defined AI as "the science and engineering of making intelligent machine."

Further, he defined it as "the study (of artificial intelligence) is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can be in principle be so precisely described that a machine can be made to simulate it" (in Russel & Norvig, 2010). Artificial Intelligence (AI) is a machine which is considered to have the ability to perform assignments and resolve the certain issues and problems as a human being does. It may also be explicated as a system of computer programme which can do tasks which generally required human intelligence like resolving complicated problems, making choices and decisions, objects deduction, images and faces recognition and so on. (Zulekha, 2019). In general, it is an electro mechanical process of a machine that thinks, understands the languages, solves

the problems, perceives and anticipates the environment, adapts the situations, anticipates the actions and so on.

The starting point for AI in its current avatar is the availability of large volumes of data, the code of which is written by humans, and is further generated by machines which mine and analyze the data to derive patterns which can be refined by running these through even more data. In education, such big data would comprise educational content developed by teachers, educators, education systems and experts, banks of teaching approaches / methodologies, assessment banks; these data are relatively static'. Dynamic big data includes information on transactions (lessons and activities) and student responses to activities and assessments. This big data can be used to develop algorithms that can support:

1. Self-learning through adaptive practice
2. Teaching through personalized education where custom content, pedagogy and assessment can be derived for each student based on her/his responses to past activities and assessments
3. Macro diagnostics and predictive models, across groups of learners (by geography, demographic profile, grade, medium of instruction, subject and other categories) The aim of an entity designing an AI application in education would include the task of capturing large volumes of curricular resources, with metadata relating to the subject area, relevant grades, language, type of resource, format of file, level of resource, role (introducing a topic, reinforcing learning) in teaching etc. NCERT for instance has listed a set of 31 such metadata elements to be tagged to each resource available in its NROER (National Repository of Open Educational Resources) repository. Another task would be to capture actual use of these resources in different learning situations, the activities of the teacher (pedagogies) and the responses of the learners to the content, usually through assessment process that seek to ascertain the level of learning/understanding of the student before and after the transaction with a resource.

Analyzing if the learner has learnt / understood the concept, the feedback for that particular resource unit and the transaction approach would be recorded. Recording thousands, millions of such responses to different resource units (along with the profile of the teacher and the learner) for a concept and combinations of these resource units with different transaction methods, with the feedback (on its effectiveness

in ensuring learning) would help the algorithm identify the effective learning resources and methods given a learner context. Identifying the few correct content along with transaction approaches would improve teaching efficiencies as well as effectiveness, is the assumption. The same can also support self-learning. A student can use resources provided by the AI engine and respond to the assessment activities, providing feedback on the learning from the content and activities provided. Based on the analyses of the feedback, the AI engine would suggest, provide further content and activities to the learner.

AI in education in India While AI in education is still in nascent stages, it is more advanced in the field of health, which can be compared with education in its essential nature and purpose, as far as the development of AI solutions is concerned. Health aims to identify issues/problems with the human body, and based on past data collected of similar problems as well as solutions provided (and responses to these solution), keep refining its repository of solutions for each of these problems (with as much data, metadata about each problem). Over time, as more and more data is collected, the number of variations in health problems and possible contextual remedies will be captured and the AI will be able to provide a most relevant solution for a given problem. For instance, Sloan Kettering Memorial Hospital is attempting to build such AI using its hospital data with the Watson Oncology Advisor. Similarly, in education, the problem of curing ignorance (promoting learning), content and pedagogies to address this ignorance and assessment data providing evidence of success/effectiveness of these content/pedagogies can be collected.

Over time as more data is available on the different challenges (learning requirements, misconceptions), and solutions (custom content and pedagogies), the AI will be able to suggest the appropriate content/pedagogy for any learning requirement, assessing the learner context, profile and aptitudes. In the USA, the approaches outlined above are already being used by AI applications such as Watson Teacher Advisor (from IBM) and G-suite for Education (from Google). The widespread use of personal digital devices by students provides vendors like Google to collect large volumes of data. While full-fledged personal analytics and personalized learning is still some time away, the approach of the current AI models gives us a basis to imagine a future where the AI algorithms would understand the learning levels, misconceptions, learning styles, interest areas, needs/priorities of each student and based on these provide custom content, pedagogies and assessments for each

learner. In India, since digital education in schools is still long way off from being universalised, thanks to basic infrastructure, maintenance, electricity issues, data collection is still in its nascent stages. A company that has developed a product called Mindspark claims to have data from assessments which run into millions of tests for lakhs of students.

If a student is able to complete a two-digit addition sum (without carry over), he could move to the next step of addition with carry over. If the student gets the two-digit addition wrong, then more two digit sums and /or single digit addition sums can be provided to assess if student has understood the concept of addition. Text problems more connected to the life of the student can be provided instead of plain numeric sums. This is provided as an example to help understand the working of the AI engine. Thus, AI can help in identifying relevant learning methodologies for diverse contexts through use of big data, thereby enabling improved quality of education. Government of India collects micro level data on students every year which is available on the UDISE (Universal District Information for School Education). However, the government has not yet developed any AI infrastructure for analyzing this huge data. This information is collected only once a year, and is therefore static but could be analyzed to derive directions for provision of school infrastructure, teachers as well as possibly, predictions of potential drop-outs based on demographic profile (socio-economic factors) information.

AI in education challenges There are several challenges to the use of AI in education. Some are common to the use of AI across sectors. The first one is that the algorithms constituting the AI are not neutral or objective (assuming there could be such a thing). Biases of the programmers get into the code and get amplified in the machine generated code. This sometimes becomes clearly evident in the outcomes, such as the cases of criminal profiling algorithms being more (and unfairly) severe on African-Americans in the USA, as also areas such as credit scoring, insurance premium determination etc. In the Indian education scenario, this risk is very severe. The predominant folk-pedagogies in India privilege education in English medium, over the local/regional language, focus on cracking the examinations than in understanding concepts/making meaning, this is an important cause for rote memorization as the predominant mode of learning. AI is also likely to promote such beliefs and further impoverish learning possibilities of students, especially those belonging to marginalized sections. Secondly, the current syllabi, in many cases reflects the urban,

upper caste, upper class, Hindu and male bias of the syllabi developers. For instance, though agriculture is the livelihood of a majority of the population of India, agricultural practices and ideas have very little place in the text book. Derivations of such content would also reflect these biases.

The teacher population profile also reflects these bias, with teachers in government and aided schools, increasingly belonging to a class and caste different from their students. On the societal side, India is a rigid and feudal society, with widespread problems such as marginalization on grounds of caste, gender, religion and class. The caste system in a sense already uses some kind of intelligence to predict that the best chances for the son of a potter would be to become a potter and of a trader, to become a trader. Secondly the people who would work in the AI algorithms design would be consist of more tech biased people technologists or tech-enamoured educators, who are less likely to be aware of the complexities of education.

**Purpose of education** The primary aim of education is to produce / strengthen a sense of agency in the learner. Hence, life choices based on capacities and aptitudes may be inappropriate for a learner and may end up strengthening legacy evils such as caste system. Thus existing biases and harmful approaches will get amplified through rote / drill learning, inappropriate curricular materials, privileging tendencies over inclinations/interests. At a macro level, the purpose of education is to support the learner to become a 'responsible citizen'.

This may require the educational processes to question dominant perspectives and beliefs. 'Going against the grain' may often be essential for progress/breakthrough in society, no society can move forward by looking at rear view mirror. Algorithms can carry the biases of the people developing them. Another challenge is transparency of algorithm. To reduce if not avoid problems of bias, it will be required to subject the algorithms to audit. For this the algorithms should be released as open source for others to review and comment. Google for instance has a project that releases AI algorithms as open source. However, release of algorithms as open source can also increase chances of misuse of such algorithms. Another option would be for specialized agencies auditing the code, on behalf of regulators. The dominant model of implementing digital technologies has been through proprietary models.

These models distort competition possibilities and provide for huge rent seeking possibilities. Thus Microsoft has been the leader in the



office automation space, which enabled super normal profits for the company. This has been amplified in the AI space, with most AI development with very few corporations, all American companies. Google, Facebook. Amazon, Microsoft etc. Traditional arguments for benefits of free markets have emphasized the role of competition in ensuring benefits for consumers.

However, due to the network effects we have seen the opposite phenomena of monopolies of oligopolies in the digital space. Google holds a large part of the search share while Facebook is a near monopoly in the social media space. (Network effect is the phenomena by which the more users our product, the more users you will attract. Since Facebook is the most popular social media platform, it is the platform that new users will join. This is because users of competing products cannot connect to users of Facebook due to lack of interoperability. This is also a reason why Microsoft office dominated the office automation world with its proprietary software producing outputs with proprietary formats that were not easy to read and edit in other office products, locking in 8 users into its software. Indeed, today's market place is so distorted that new entrants try to buy up the market with huge price discounts, freebies, burning up venture capital cash. The venture capitalists fund a company which is making huge losses in its business only because of the expectation of super normal profits, once the company kills competition with predatory pricing and becomes a (near) monopoly. Even in the area of AI, the company that manages to collect and control large volumes of data will be in a position to command the market.

Mitigation of challenges to save us from a Kafkaesque future, we must democratize AI. The first issue is the ownership of data collected about teachers and students. Currently in the absence of any frameworks, such data may be under the possession and de-facto ownership of the IT company providing the solution. For instance, users of google suite for education in Vishakapatnam corporation schools, would be providing data about themselves as well as their transaction and assessment information would be collected by Google. Availability of this data for the school itself, the teachers and students (both micro individual data, as well as data aggregated for the school) is unknown, as well as to other organizations interested in analyzing the data to refine their AI engines. Frameworks to ensure an ethical AI are essential, these should stipulate data ownership to lie with the school and not allow

for monopoly control of data by the company providing services to the school.

Second issue is the transparency of the code that analyses the data. The code will hide the biases of the coders and hence it is essential that it should be visible to audit. The Google search engine is designed to throw advertisements and page rank can be influenced by its commercial interests, the code may consciously or unconsciously reflect the commercial interests of the company and the only way to avoid this problem is to make the code subject to audit (volkswagon car diesel exhaust case). Either the code should be released as open source under copy left licensing (such as GPL) or be provided to specialised agencies for audit (both white box and black box). Only audited versions should be provided to production cases. Beta code not subject to audit should not be provided to schools.

The usage of technology in education has revolutionized education systems with better reach and improved execution. The Association for Educational Communications and Technology (AECT) defined educational technology as “the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources”. It denoted instructional technology as “the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning.” The pandemic imposed online delivery of classes and technology has played a critical role in that. The current situation seems that the best way for education, for now, is online, and hence it is vital to fine-tune online education further.

AI will be an enabler in improving online education. It can catalyze the online education market in India, which is poised to reach USD 1.96 billion in 2021. The role of teachers in education systems is irreplaceable; however, AI will aid and improve a teacher’s job. AI is expected to fill the gaps in learning and teaching methodology and delivery. With the help of AI, students can get personalized curriculum, tests, learning methods and delivery. This otherwise had been a challenge for teachers as managing and providing teaching that suits every student’s specific needs was nearly impossible. According to Business Today, by 2024, 47% of learning management tools will be AI-enabled. Also, AI in the education industry is expected to reach a CAGR of 40.3% between 2019-25.



Artificial Intelligence (AI) is revolutionizing various industries, and the education sector is no exception. AI technologies have the potential to transform traditional teaching methods, personalize learning experiences, and improve overall educational outcomes. In this blog post, we will explore how AI is making its mark in the school education sector and the benefits it brings to students, teachers, and educational institutions.

### **1. Personalized Learning**

One of the key advantages of AI in education is its ability to personalize learning experiences. AI algorithms can analyze student data, including their strengths, weaknesses, learning styles, and preferences, to develop tailored learning paths. Adaptive learning platforms powered by AI can provide individualized instruction, presenting content at the appropriate pace and level of difficulty for each student. This personalized approach helps students grasp concepts more effectively, stay engaged, and achieve better learning outcomes.

### **2. Intelligent Tutoring Systems**

AI-powered intelligent tutoring systems act as virtual tutors, offering personalized guidance and feedback to students. These systems use natural language processing and machine learning to interact with students, answer their questions, and provide step-by-step explanations. Intelligent tutoring systems can identify areas where students are struggling and offer targeted interventions, helping them overcome challenges and improve their understanding of complex topics.

### **3. Enhanced Administrative Efficiency**

AI can streamline administrative tasks in educational institutions, freeing up valuable time for teachers and administrators. AI-powered systems can automate administrative processes such as grading, attendance tracking, and scheduling. This automation reduces the administrative burden, allowing teachers to focus more on instruction and student support. Additionally, AI can assist in data analysis, helping schools gain insights into student performance, identify trends, and make data-driven decisions to improve overall educational quality.

### **4. Intelligent Content Creation and Recommendation**

AI technologies can assist in content creation and recommendation, providing educators with valuable resources and materials. AI algorithms can analyze vast amounts of educational content and curate

relevant resources based on specific topics, learning objectives, or student needs. This helps teachers access high-quality materials, saving them time and effort in lesson planning. AI can also assist in generating educational content, such as automated assessment items or interactive learning modules, offering educators additional resources to engage students effectively.

### **5. Early Intervention and Student Support**

AI tools can identify early signs of academic challenges or potential learning difficulties. By analyzing student performance data, AI algorithms can flag at-risk students who may require additional support. This early intervention enables teachers and support staff to provide timely assistance, addressing learning gaps and ensuring students receive the support they need to succeed.

As stated in this article, AI in education can assist our teachers in increasing their efficiency by using AI applications such as real-time text to speech and text translation systems, automating mundane and repetitive tasks such as taking attendance, automating grading, personalizing the learning journey based on experience, skill, and understanding, and so on. Artificial intelligence has a huge potential in India, and to fully use it, AI education in India has to be executed on a national basis. PictoBlox AI, India's first interactive AI education platform, has been developed to provide a fulfilling project-based learning experience through its artificial intelligence and machine learning tools integrated into a graphical programming interface, to implement AI education in India and prepare the youth for an AI future. It includes learning materials such as tutorials, guided projects, and a tutor-led online AI course, all designed with generation in mind.

### ***Conclusion***

India has long advocated for universal education. India now has a population of about 600 million young people. They all deserve a good education, skills, and employment. At the same time, AI education may become more accessible and inclusive. Around the world, many tutoring services and learning applications with skill-based curricula are being created. These AI-enabled technologies will allow you to access worldwide classrooms from the comfort of your own home. It will not only empower students but will also assist teachers in keeping up with current trends. Such solutions might be extremely beneficial to rural schooling. Students in the most distant corners of India would be able to learn in the same way that students in metropolitan areas

do. To make India a US\$5 trillion economy, we must tap into the creative potential to develop an innovation-led growth model that will aid in the transformation of our country into a new India. Artificial intelligence will play a critical role in assisting us in achieving this goal. AI's influence on India is larger than one can see or fathom, and it will only grow with time, requiring the youth to be prepared. AI education is critical to making Indians AI-ready and ensuring India's position as a global AI leader.

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